KENTUCKY HEARTWOOD

Protecting the Beauty and Wellbeing of Kentucky's Native Forests

District Ranger Tim Reed
Daniel Boone National Forest
Stearns Ranger District
3320 Highway 27 N
Whitley City, KY 42653

RE: Jellico Vegetation Management Project (Jellico Project)

December 5, 2022

Dear District Ranger Reed,

Thank you for the opportunity to comment on the Jellico Vegetation Management Project. We also thank you for providing an extended 45-day comment period and your willingness to participate in the public meeting in Williamsburg. I think we can all agree that public input and dialogue are important, especially for a project of this scale.

As it stands, Kentucky Heartwood strongly opposes the management described in the proposed action. Our reasoning and specifics are provided below.

We are attaching a separate document that includes copies of all materials cited which were accessible in full-text electronic format. It is likely that we will learn more about the project area and have more input to provide in the future. We will be certain to provide you with any additional information as promptly as possible.

1. Purpose and need

The Jellico project is conditioned upon a too-narrow purpose and need which misrepresents, or at best truncates, Forest Plan Goals and Objectives. To read the Jellico scoping letter one would assume that the only goal of the Forest Plan, or the 1.K Habitat Diversity Emphasis management prescription, is to create even-aged, young forest habitat. Even limiting consideration to the Goals and Objectives for the 1.K Habitat Diversity Emphasis, a wide range of community and structural types, including interior forest, are presented in the Forest Plan. Proposing a project that is solely focused on a single Objective, creation of 0-10 age class forest, is improper. The Jellico project should be developed around meeting a full suite of Forest Plan and community goals and desires.

2. Community input and concerns

Kentucky Heartwood is in support of the community members who have expressed their concerns about flooding, landslides, and clearcuts. There are many well-informed residents in Whitley and McCreary counties who live in or close the project area, and we implore the Forest Service to carefully listen to them. The information they are providing is invaluable in assessing the environmental impacts of the Jellico Project. Due consideration of their concerns is required by law under the National Environmental Policy Act (NEPA).

The Council on Environmental Quality's citizen's guide to NEPA explains:

> "NEPA requires Federal agencies to consider environmental effects that include, among others, impacts on social, cultural, and economic resources, as well as natural resources. Citizens often have valuable information about places and resources that they value and the potential environmental, social, and economic effects that proposed federal actions may have on those places and resources. NEPA's requirements provide you the means to work with the agencies so they can take your information into account."[1]

3. Implementation and analysis timeframe

The scoping document states that "the purpose of and need for this project is to meet the Forest's goals for management as defined in the Land and Resource Management Plan for the Daniel Boone National Forest." The Daniel Boone Land Resource and Management Plan (LRMP or Forest Plan) was adopted in 2004 and intended to guide management on the forest "for the next 10 to 15 years" (LRMP 1-1). While Congress has routinely allowed extensions, the National Forest Management Act (NFMA) requires Forest Plans to be revised "at least every fifteen years." Available publications from the USFS indicate that a new Forest Plan for the DBNF will not be completed until at least 2027. The 2004 Plan was developed under the 1982 planning regulations, which were replaced in 2012. The 2012 planning regulations place a greater emphasis on ecosystem sustainability than the 1982 regulations and reflect a more current understanding of ecosystem management following 30 years of learning.

The scoping document states that the Jellico Project will be implemented over 40 years, "from approximately 2023 to 2063." This timeframe presents numerous problems for the project analysis and approval of any management actions. Foremost is that the project will still be underway implementing the 2004 Forest Plan more than a half-century after the Plan's development and over 40 years beyond the Plan's intended duration as a guiding document. Implementation will be ongoing for more than 80 years after the promulgation of the 1982

[1] Council of Environmental Quality (2007) A Citizen's Guide to the NEPA. https://ceq.doe.gov/docs/get-involved/Citizens_Guide_Dec07.pdf

planning regulations and 50 years after their revision. In addition to the unforeseeable changes in environmental conditions over the next four decades, there is little doubt that our understanding of conservation planning and practices, as well as public perceptions of social good, will change substantially. Making concrete management decisions today on what will be logged, and how, four decades in the future is improper under this basic framework.

This timeframe presents other, more issue-specific, problems which will be addressed in the sections below.

4. Natural history and natural range of variation (NRV)

Any management decisions for the Jellico area need to be made with an understanding of the area's historical ecology and the natural range of variation (NRV) of community and disturbance types. The NRV concept is emphasized in the definition of *Ecological Integrity* under the 2012 Planning Rule at 36 CFR Section 219.19:

> "The quality or condition of an ecosystem when its dominant ecological characteristics (for example, composition, structure, function, connectivity, and species composition and diversity) occur within the natural range of variation and can withstand and recover from most perturbations imposed by natural environmental dynamics or human influence."

While the DBNF Forest Plan was developed under the 1983 planning regulations, the revised 2012 Planning Rule provides insightful direction toward fulfilling the National Forest Management Act (NFMA) by incorporating the NRV into forest and project planning as a key component of managing for sustainability and ecosystem integrity.

> **§ 219.8 Sustainability**
> The plan must provide for social, economic, and ecological sustainability within Forest Service authority and consistent with the inherent capability of the plan area, as follows:
>
> (a) Ecological sustainability.
>
> (1) Ecosystem Integrity. The plan must include plan components, including standards or guidelines, to maintain or restore the ecological integrity of terrestrial and aquatic ecosystems and watersheds in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity, taking into account:
>
> (i) Interdependence of terrestrial and aquatic ecosystems in the plan area.
>
> (ii) Contributions of the plan area to ecological conditions within the broader landscape influenced by the plan area.
>
> (iii) Conditions in the broader landscape that may influence the sustainability of resources and ecosystems within the plan area.

> (iv) System drivers, including dominant ecological processes, disturbance regimes, and stressors, such as natural succession, wildland fire, invasive species, and climate change; and the ability of terrestrial and aquatic ecosystems on the plan area to adapt to change.

An understanding of the NRV of the Jellico area and surrounding region should serve as a basis for landscape-scale and site-specific planning and the setting of habitat targets. It should also inform the identification of management tools that best emulate historical processes or serve to return community structures and processes to approximate historical conditions. We present here a discussion of the natural history of the Jellico area, as well as a summary of the primary disturbance regimes that are understood to have shaped the forest.

Influential forest ecologist E. Lucy Braun conducted detailed and extensive research in the forests of eastern Kentucky in the first half of the 20th century, including the Jellico Mountains. In "Forests of the Cumberland Mountains" (1942) she stated:

> "The western part of the Cumberland Mountains in the vicinity of Williamsburg and east of Pine Knot is a maturely dissected area of strong relief, topo- graphically distinct from the adjacent submaturely dissected Cumberland Plateau. This topographic difference accentuates a vegetational boundary that would otherwise be obscure. Mixed mesophytic forest with almost pure secondary groves of tulip trees on northeast slopes contrasts with the oak, oak-pine or beech woods of the flatter areas of the Plateau."[2]

Generally, northerly-facing and lower slopes in the Jellicos represent mixed mesophytic forest communities with a limited oak component. Dry and dry-mesic oak communities are largely restricted to southerly and upper-slope positions. Braun presents data and a discussion of Buck Branch in the Jellicos (which is included in the project area) and supports these observations.

> "Buck Branch of Jellico Creek is an eastward-flowing stream only a few miles from the western border of the Cumberland Mountains east of Pine Knot (location 21 on map, Fig. 1). Although the low vegetation has been somewhat affected by hogs and sheep, most of the species are probably represented in sheltered or inaccessible spots. The tops of large sandstone blocks lying on lower slopes (derived from higher strata which form the ridge crests) are veritable flower gardens with *Sedum ternatum*, *Arisaema triphyllum*, *Smilacina racemosa*, *Trillium Hugeri*, plants which should be abundant throughout the ground layer. In respect to canopy, the forest is a virgin stand affording opportunity for study of ravine and slope forests of different exposures. The similarity of the ravine and

[2] E. Lucy Braun (1942). Forests of the Cumberland Mountains. Ecological Monographs Vol. 12, No. 4 (Oct., 1942), pp. 413-447

north slope forests is apparent (Fig. 33). The topographic locations of areas distinguished on the chart are shown in Figure 32. On the lower south slopes, the beech-white oak or beech-white oak-tulip tree forest type prevails, giving way upward to oak-tulip tree and finally, on the rocky very steep uppermost slopes, to chestnut oak forest with an open heath layer and sparse sandy soil herbaceous flora. On these highest slopes the rocky immature soil is covered by a thin layer of mor."[3]

Figure 33 provides canopy tree data illustrating the dominance of American beech, sugar maple, yellow buckeye, and other mesophytic, fire-intolerant species on northerly slopes and restriction of oaks to southerly slopes and ridge tops.[4]

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[3] Id
[4] Id

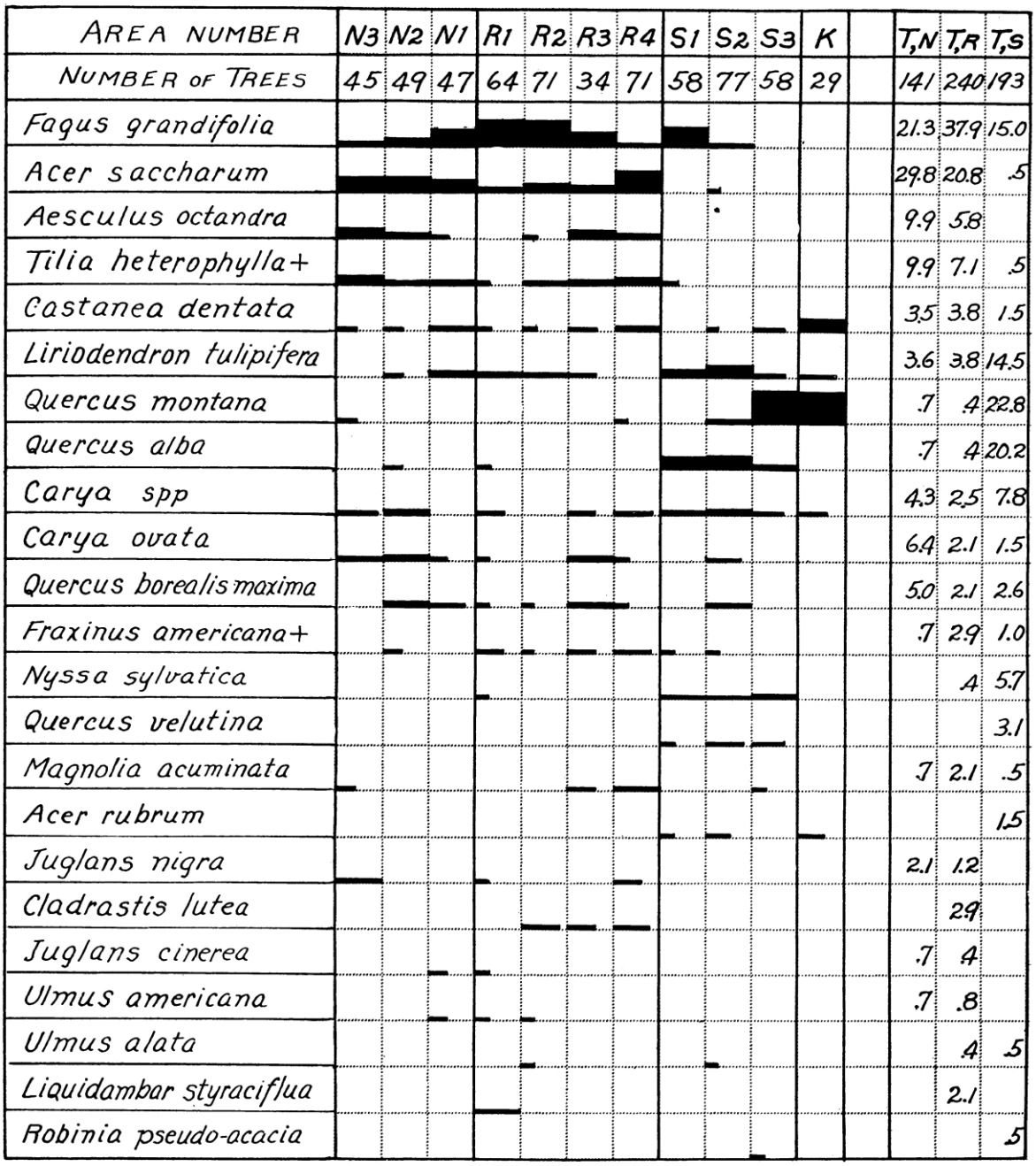


FIG. 33. Percentage composition of canopy of forest communities on Buck Branch of Jellico Creek (location 21 on map). North slope, south slope, and ravine forests distinguished by N, S, and R, respectively; K, knobs. See Figure 32 for topographic locations of communities.

Figure from Braun (1942) showing canopy tree species across Buck Branch transect

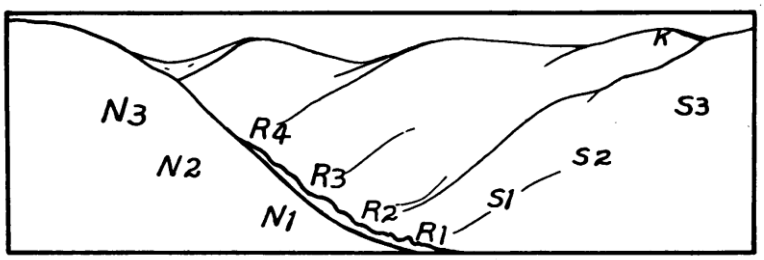


FIG. 32. Sketch designed to show topographic locations, in Buck Branch forest, of areas distinguished in chart, Figure 33.

Figure from Braun (1942) showing topographic sample locations across Buck Branch transect

Braun's observations, which still largely hold, are consistent with what is known about the primary ecosystem drivers that shaped this community structure. We describe some of the primary, historical ecosystem drivers below.

1) ***Edaphic conditions*** **–** Forests in the Jellicos are drier on south and southwest slopes and ridges and more moist (mesic) on north and northeast slopes and in ravines. This pattern is driven by sun exposure and groundwater following gravity down. Soil moisture affects the forest community in several ways. First, available moisture can directly affect species composition by either promoting draught tolerant species in drier sites (restricting growth or survivability of drought-intolerant species) or by promoting competition by faster-growing mesic species where soil moisture is readily available.

   Soil moisture also indirectly affects forest structure and composition through affecting patterns of treefall. Trees on mesic sites are more prone to windfall on account of saturated soils, and gaps created by treefall in these sites tend to be larger on account of trees growing large on more productive sites.[5] Soil moisture also has important indirect effects with regard to fire effects. Fires are more likely to burn drier sites, resulting in more frequent fires on south and southwest slopes than north or northeast slopes and ravines. The Forest Plan recognizes that these locations tend to not burn due to moist site characteristics, stating "Since higher moisture conditions on these sites typically limit the use of fire as a site preparation tool, oak and pine regeneration is normally limited" (Forest Plan H-5).

2) ***Fire*** **–** It is well understood that eastern and Appalachian forests evolved with natural and anthropogenic fire. Indigenous peoples likely used fire for millennia, with greater frequency near and around villages and gardens. Cycles of use and abandonment resulted

[5] See Hart, Justin (2016), Gap-Scale Disturbances in Central Hardwood Forests with Implications for Management *in* Natural Disturbances and Historic Range of Variation," C.H. Greenberg and B.S. Collins (eds). Spring International Publishing 2016.

in various types of ESH and pioneer species, especially along the valley bottoms. These effects are thought to have increased and intensified following Euro-American colonization and settlement.[6] While the exact return intervals will never be known, most oak forests in eastern Kentucky are assumed to have had fire return intervals between 8 and 15 years. As discussed above, fire would have been more prevalent on drier south and southwest facing sites and is reflected in the predominance of fire-tolerant species in these landscape positions. Mesic sites would have burned much less frequently.

In addition to helping drive species composition through increased, direct mortality of thin-barked fire-intolerant species, periodic fire is assumed to have resulted in relatively open forest conditions with fewer understory trees and more scattered canopy trees. This environment would have supported the regeneration of several oak species, including white oak, which are considered "mid-tolerant" with respect to light requirements for regeneration and growth. Stand replacing fires are extremely rare, though "hot" fires in drought conditions were probably important in creating early seral habitat (ESH).

3) ***Oak decline and forest pests*** **–** A variety of native, natural species interact with drought and other factors to cause decline or death in trees. It is thought that these processes have been exacerbated by historical clearcutting followed by fire suppression, resulting in some forests being subject to increased competition and related drought stress. The death of some trees to these factors is a part of the natural dynamics of the Jellicos. However, research shows that oak decline events typically kill only a small percentage of trees (~10%), with the most severe incidents rarely resulting in death of more than about 1/3 of trees in an affected area. Furthermore, research shows that most mortality is restricted to trees in the red oak (*Erythrobalanus*) group, with white oaks (*Leucobalanus*) being much more resilient. Trees that survive these events frequently experience increased growth as a result of reduced competition.[7]

4) ***Ice storms and passenger pigeons*** **–** While often perceived with dismay, ice storms are a regular disturbance event in the Jellico mountains and surrounding region. However, like oak decline, the effects of ice damage on trees are not uniform and typically result in a "thinning" effect on forests. Lafon (2016)[8] states:

[6] See Greenberg, Cathryn H., Kendrick Weeks, and Gordon S. Warburton (2016), The Historic Role of Humans and Other Keystone Species in Shaping Central Hardwood Forests for Disturbance-Dependent Wildlife, *in* Natural Disturbances and Historic Range of Variation," C.H. Greenberg and B.S. Collins (eds). Spring International Publishing 2016

[7] See Oak, Steven W., Martin A. Spetich, and Randall S. Morin (2016), Oak Decline in Central Hardwood Forests: Frequency, Spatial Extent, and Scale *in* Natural Disturbances and Historic Range of Variation," C.H. Greenberg and B.S. Collins (eds). Spring International Publishing 2016

[8] See Lafon, Charles W. (2016), Ice Storms in Central Hardwood Forests: The Disturbance Regime, Spatieal Patterns, and Vegetation Influences, *in* Natural Disturbances and Historic Range of Variation," C.H. Greenberg and B.S. Collins (eds). Spring International Publishing 2016

> "A dual pattern of opposing ice storm signals has been identified, where trees with heavily pruned crowns suffer reduced radial growth for one or more years (up to a decade) after a storm… Other trees, in contrast, show the typical forest disturbance signal, a growth increase. This rise in radial growth apparently reflects the release of the tree from competition with surrounding trees that were killed by the storm."

Lafon continues:

> "In relatively mild events, less than 10% of trees sustained serious injuries… The most severe ice storm disturbances caused serious injuries in more than 30% of the trees, and even up to 70-80 % of the trees in some cases."

The effects passenger pigeons are less well understood, but roosting flocks are assumed to have resulted in canopy breakage similar to that of severe ice storms, compounded by large amounts of nutrient input.

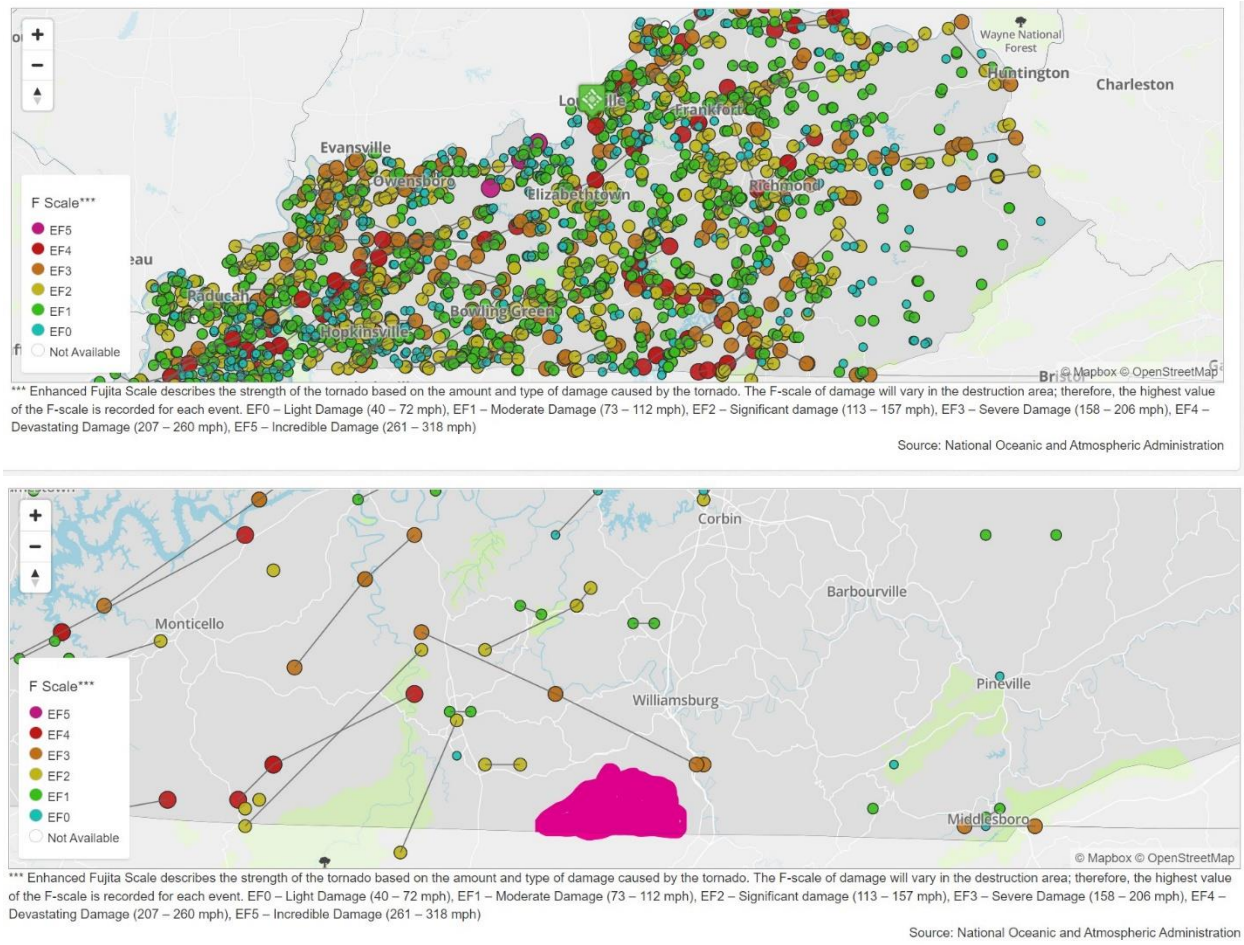
5) ***Beaver –*** Prior to Euro-American settlement and the fur trade, American beaver (*Castor canadensis*) were exceptionally abundant across the North American landscape. Beaver are understood to have affected vegetation structure and stream flow in profound ways in nearly every watershed, including in Kentucky and the Jellico project area. In addition to aquatic habitats, beaver have major effects on the creation and maintenance of multiple types of early seral habitat (ESH) and at multiple spatial scales.[9] This includes wetland, grassland, shrub, edge, and high-density sapling vegetation structures. It is expected that these habitats would have been prevalent in most or all of the valleys in the Jellico project area. It would be hard to overstate the effects of their loss on ESH-dependent species.

6) ***Wind –*** Wind disturbances include a wide variety of events and severities. The most frequent wind events result in the blowdown or breakage of individual trees or small groups of trees. Infrequent, high intensity events include tornados and derechos which can result in stand replacement. Little data are available regarding derechos, though available data show that tornadoes are infrequent in the mountainous portions of eastern Kentucky and central Appalachia.[10] The following images represents all tornados in

[9] Naiman, R. J., C. A. Johnston, and J. C. Kelley. 1988. "Alteration of North American Streams by Beaver." Bioscience 38: 753– 62.

[10] See Peterson, Chris J., Jeffery B. Cannon, and Christopher M. Godfrey (2016) Firest Steps Toward Defining the Wind Disturbance Regime in Central Hardwoods Forests, *in* Natural Disturbances and Historic Range of Variation," C.H. Greenberg and B.S. Collins (eds). Spring International Publishing 2016

Kentucky from 1950 through August, 2022 with the Jellico project area denoted in pink in the second, close-up image.[11]



Map of Tornadoes 1950 through August 2022

All of the above ecosystem drivers, along with others, interacted over time and space to create the forest that existed prior to the massive clearing and disruptions that accompanied Euro-American settlement of the region. Many of the historical processes continue to occur and affect our forests, while others have been eliminated or substantially disrupted.

Perhaps the most important take-away, with respect to the Jellico project, is the rarity of stand-replacing disturbance events on the historical landscape. Contrary to the area's natural history, the Forest Service has emphasized stand-replacing clearcut, shelterwood, and deferment cuts to shape the future Jellico forest. Much of the forest is already in a largely unnatural, even-aged condition from past clearcutting. Instead of working to restore structural and functional processes on the landscape, the Jellico Vegetation Management Project proposes extreme measures that are

[11] A history of twisters: Tornadoes in Kentucky since 1950, Louisville Courier-Journal accessed at https://data.courier-journal.com/tornado-archive/ December 2, 2022

far outside the forest's natural range of variation. The "balanced age classes" model of forest management that the project is predicated on is effectively an agricultural model, and which fails to emulate the predominant historical and natural processes, structures, and functions.

5. Geographic scope of analysis & private lands

The Forest Service needs to consider and contextualize management of DBNF lands within an appropriate and consistent geographic area. Limiting the analysis to federal lands in the project area is arbitrary and not rational. This is particularly the case when considering habitat needs for wildlife and cumulative downstream effects to aquatic habitats. While the DBNF Forest Plan was developed under the 1983 planning regulations, we point to the 2012 Planning Rule which directs the Forest Service to place management goals within a framework that considers national forest lands within a landscape framework that extends beyond areas under federal control. 36 CFR 219.8 (a)(1) states that Forest Plans must manage for Ecosystem Integrity, including "Contributions of the plan area to ecological conditions within the broader landscape influenced by the plan area" and "Conditions in the broader landscape that may influence the sustainability of resources and ecosystems within the plan area."

Private lands surrounding and interspersed within the project area have historically been and continue to be utilized for a wide range of activities that result in ESH. Logging, mining, agricultural, and other uses have created young forest, mid-density forest, edge habitat, and other types of ESH. A majority of the Jellico Mountains is in Tennessee, where none of the area is protected and large areas are owned by timber and mining interests. A majority of land within the 5th level (HUC 10) watersheds encompassing the Jellicos are privately owned. The 5th level watershed is the scale at which goals for 0-10 age class forest are established in the Forest Plan.

One example of the importance of considering the relationship between private and NFS lands is in the eastern portion of the project area. The Jellico project proposes regeneration cuts on most of the NFS land in the eastern portion of the project area above Kensee Hollow. Much of the adjacent private land has been recently logged. The cumulative result of the proposed action will be to nearly eliminate mature and interior forest in this area. The figure below shows the Kensee Hollow section with DBNF lands in green, proposed regeneration cuts as red crosshatch, and areas clearcut in the 1990s in pink.

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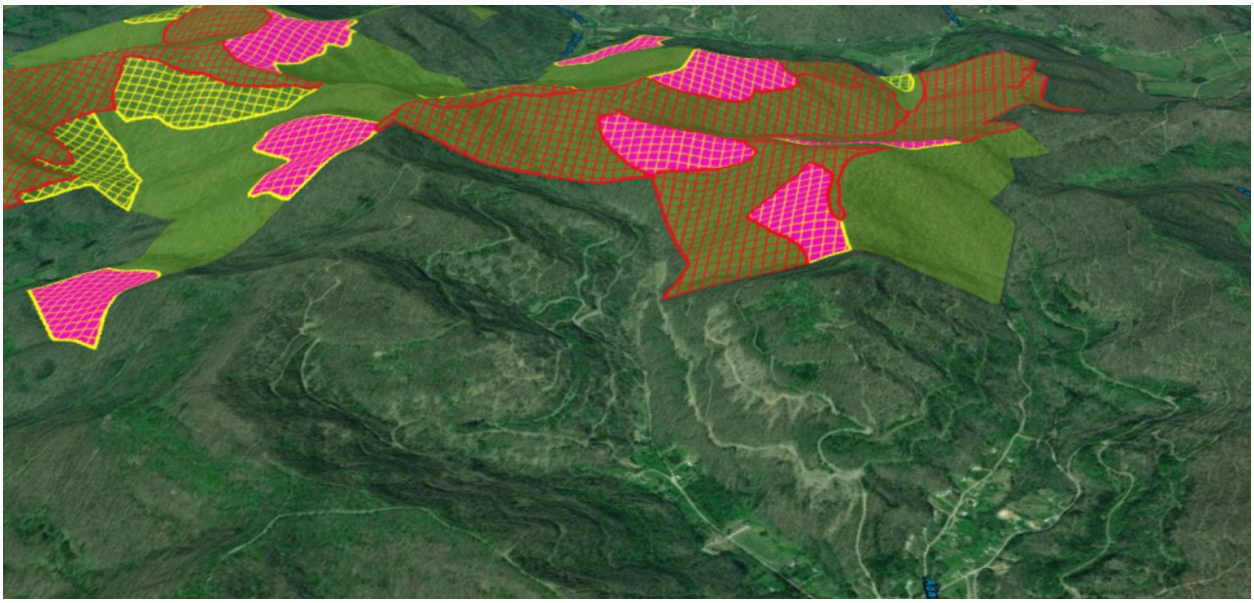

Even the most cursory review of aerial imagery from KY-92 south to the TN border, as well as lands in the TN section of the Jellicos, makes it obvious that most forests in the area continue to be heavily disturbed by logging and mining. The Forest Service should prioritize management for mature, old-growth, and interior forests on DBNF lands.

6. Interior forests

A majority of the national forest lands in the Jellico project are within the 1.K Habitat Diversity Emphasis management prescription area. 1.K-Objective 1.C. states that the Forest Service should:

> "Maintain 30 percent within each 5th level watershed in a relatively closed canopy forest at least 70 years old with midstory and shrub/sapling layers. One-fourth of the 30 percent should be maintained in blocks of at least 620 acres for interior habitat. Each block can include up to 200 acres from adjacent cliff and riparian areas; up to one third of each block may be thinned to no less than 60 basal area." (Forest Plan 3-35)

Footnote 20 states:

> "Service level A and B roads and roads having width exceeding 50', will break up a "block". Up to 5% of the block can be in 0-10 age class or other openings."

It is important to point out that this Objective does not include Designated Old Growth as helping to meet the Objective. It is specific to 1.K lands with "up to 200 acres from adjacent cliff and riparian areas."

Inclusion of this objective in the 1.K Habitat Diversity Emphasis management prescription area serves to ensure that both disturbance dependent and interior forest species have suitable habitat on the landscape. In the recent South Red Bird project, the Forest Service eliminated the possibility of managing for interior forests under this Objective and responded to our concerns merely with a cursory rationale presented in a response to comments document. This is an issue that we are now having to address through litigation.

It appears from the available data that the Jellico proposal will preclude the Forest Service from meeting this Objective. It is also difficult to perform this analysis given that harvests will take place over 40 years, and it is not clear how harvests (especially regeneration harvests) will be distributed over space and time. Regardless, the Forest Service must undertake a robust analysis to show how 1.K-Objective 1.C is being met and, if not being met, how the proposed action deviates from this objective including a rationale for why 1.K-Objective 1.C continues to be ignored.

7. Old-growth

Old-growth forests are important for a variety of reasons, including biodiversity, carbon sequestration, social values, scientific research, and others. While it is impossible to say precisely, it is generally thought that at least 50% of Kentucky's forested landscape was historically in an old-growth condition. This is based on limited historical accounts and an understanding of the range of natural and anthropogenic disturbance regimes that shaped Kentucky's landscape prior to Euro-American settlement and colonization.

Within the forestry profession (including within the DBNF) there is an often-expressed belief that old-growth forests and trees are "senescent," inherently unhealthy and magnets for forest-destroying pests. And, therefore, the responsible course of action to manage for forest health and resiliency is to cut down these "old" trees. This perspective is demonstrably incorrect and should not inform planning in this project. We discuss the changing science on the longevity and resilience of old-growth forests and trees later in this letter in section *16. Forest carbon and logging.*

Another problematic misconception about old-growth that we have encountered in our years of dialogue with the Forest Service is a synonymizing of "old-growth" with shade-tolerant forest communities. This antiquated perception is based on historical definitions of "climax forest" that placed old-growth in a narrow successional model. That model does not reflect the last 50 years of understanding, nor the diversity, of eastern old-growth forests. However, this continues to lead to erroneous arguments that "old-growth" is synonymous with mesophication and the replacement of oaks by red maple. This is not at all the case.

Old-growth in eastern deciduous forests, including Kentucky, includes a wide range of structural and compositional conditions.[12] These conditions develop not in the *absence* of disturbance, but in the *presence* of small- to intermediate-scale disturbance events which drive structural complexity. The unifying characteristic across the suite of eastern old-growth forest types is that trees and forests are allowed to get "old," and thereby develop a variety of structural attributes that are often missing from younger forests – even those considered "mature" by forestry standards.[13] This includes things like large coarse woody debris, snags, and den trees (preferred by denning black bears)[14,15], as well as major structural differences like larger-forming canopy gaps[16] and dominant canopy trees that provide preferred habitat for Cerulean warblers, among other species.

Old-growth in the Jellico project area *can* look like a classic "climax" forest populated by predominantly shade-tolerant species like sugar maple, American beech, and eastern hemlock. But it can also be represented by "sub-climax" or "seral old-growth" dominated by oaks, hickories, and tulip poplar. These latter old-growth communities can include fire-modified forests with relatively open canopies, as well as xeric forests with very old, but small, trees constrained in their growth by edaphic conditions. Definitions of old-growth forest also include "secondary old-growth," which describes forests that experienced a stand-replacing disturbance event (e.g., clearcutting) but which have, over time, developed the structural forms of primary old-growth. Perhaps the most common old-growth forests in the DBNF are those which experienced significant logging more than 130 years ago, but where some non-marginal number of original trees were retained. These forests tend to meet criteria for secondary old-growth (given time since last harvest), but also tend to have greater structural diversity due to the presence of legacy trees. An example of this latter forest type are stands 08311662670004 and 08311662670002, which meet the minimum age criteria for POG but were found to include trees over 200 years old.[17] Both stands are currently proposed for a deferment harvest.

This variety of old-growth types and forms is incorporated into the DBNF Forest Plan directly and through the Region 8 Guidance for Conserving and Restoring Old-Growth Forest Communities on National Forests in the Southern Region (Region 8 Old-Growth Guidance).[18]

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[12] Scheff, Robert (2012). The Development of Old-Growth Structural Characteristics in Second Growth Forests of the Cumberland Plateau, Kentucky, USA. Master's Thesis, Eastern Kentucky University.
[13] Id
[14] Wathen, W.G., K.G. Johnson, M.R. Pelton. 1986. Characteristics of black bear dens in the southern Appalachian region. Bears: Their Biology and Management 6: 119-127.
[15] White, T.H., J.L. Bowman, H.A. Jacobson, B.D. Leopold, and W.P. Smith. 2001. Forest management and female black bear denning. The Journal of Wildlife Management 65(1): 34-40.
[16] See Hart, Justin (2016), Gap-Scale Disturbances in Central Hardwood Forests with Implications for Management *in* Natural Disturbances and Historic Range of Variation," C.H. Greenberg and B.S. Collins (eds). Spring International Publishing 2016.
[17] Dr. Justin Maxwell, Indiana University, personal communication.
[18] Guidance for Conserving and Restoring Old-Growth Forest Communities on National Forests in the Southern Region Report of the Region 8 Old-Growth Team June 1997

Despite this recognition of the diversity of old-growth types in the DBNF, the narrow successional model appears to still prevail among planners at the DBNF.

The scoping letter for the Jellico project lays out a flawed and unworkable management plan for preserving old-growth and following the requirements of the Forest Plan. First, the proposed action is built around a "balanced age class" model of seventeen 10-year age classes with maximum rotation age of 170 years. However, dendrochronological data from Kentucky's best studied old-growth forests (e.g., Lily Cornett Woods, Tight Hollow proposed Research Natural Area, Rock Creek Research Natural Area, Elisha Creek proposed Research Natural Area, and others) shows that the oldest cohorts of canopy trees in these forests are over 300 years old. Maximum tree ages for the dominant species can be considerably older. As such, even accepting the balanced age class model, there should be at least thirty 10-year age classes with the desired acreage of 0-10 age class forests about half of what is currently proposed. Under this model, over half of the forest should be older than the minimum stand ages for considering as potential old growth (POG) under the Forest Plan. This is further complicated by the knowledge that natural disturbance events will continue to affect these forests over time, creating ESH and young forest at different scales. Therefore, the current proposal represents an overshoot of timber cutting even under its own terms.

The 40-year implementation period for the project also creates a significant conflict with Forest Plan provisions for protecting old-growth. The Forest Plan requires specific inventories and analysis of potential old-growth (POG) forests before timber harvest can be approved. The first threshold for consideration of POG is minimum stand age for the given forest type. There are large amounts of forest proposed for cutting that do not currently meet the minimum age thresholds, but which will over the four decades of project implementation. By approving these stands for cutting now, the Forest Service appears to be using a work-around to avoid assessing those forests for old-growth status before they are cut as required by the Forest Plan. Even if the Forest Service did perform surveys of those forests now, their current condition with respect to old-growth characteristics does not reflect what their condition will be in 20, 30, or even 40 years from now. As described above, the most meaningful characteristics of old-growth forests reflect stand development processes that occur over time, and these multi-decadal timeframes are significant with regard to the development of old-growth characteristics.

8. Early seral habitat (ESH) and wildlife

Meeting early seral habitat (ESH) goals must be considered in a landscape context that includes management on adjacent and nearby non-federal lands. It is also important to recognize the different types of ESH, and how young forest does not necessarily provide the types of ESH needed by many species.

> "The term 'early successional habitat' is commonly, albeit erroneously, used generically to refer to any open, recently disturbed habitat that is transient unless maintained by

> recurring disturbances (Greenberg et al. 2011a). Although both young forest and truly early successional habitats share the features of openness in common, they differ considerably in many ways in the structure and composition of plants (Lorimer 2001; Greenberg et al. 2011a) and, because of that, the wildlife species that use them. In the CHR, high-severity natural disturbances such as large blowdowns, or anthropogenic disturbances such as regeneration harvests, create young forest with high woody stem density and thick cover for wildlife, but generally do not create bona fide successional conditions with high plant species turnover. Even after high-severity natural disturbances that substantially reduce canopy cover, plant species composition usually remains similar to the original mature forest, often with a transient addition of blackberry (*Rubus* spp.) or pokeweed (*Phytolacca americana*), as pre-existing shrubs and fallen or damaged trees resprout prolifically and tree seedlings grow from pre-established advance regeneration or seed (Lorimer 2001; Greenberg et al. 2011b)."[19]

By the limited information in the scoping letter, it appears that the Forest Service is using young or recently cut forest as a proxy for all types of ESH. This is becoming a regular issue in proposals and discussions on the DBNF. For example, the Forest Service has made claims in South Red Bird and elsewhere that young forest is needed to provide habitat for Rocky Mountain elk. Notwithstanding the fact that the Kentucky elk herd is doing extremely well, young forest habitat is not preferred habitat for elk. In the Forest Plan FEIS, Table 3 - 62. *Habitats most commonly used by demand species on the DBNF*, elk are denoted only as using "Grassy Openings." No other habitat types listed in the table are denoted as being commonly used by elk, including "Early Successional 0-10 yrs" and "Pole S/ Sapling 11-50 yrs." Similarly, wild turkey are shown in that table as being associated primarily with "Grassy Openings" and "Hard Mast and Den Producing 50+ yrs," and not young forest. White tailed deer are shown associated with nearly all terrestrial habitats except for "Pole S/ Sapling 11-50 yrs," which will become a dominant forest condition under the proposed action.

The Forest Service has also emphasized management for ruffed grouse (*Bonasa umbellus*) across the forest in recent years. In 2016 the DBNF designated ruffed grouse as a "focal species" to replace management indicator species (MIS) under the 2012 Planning Rule. This designation was intended to serve as a proxy for monitoring success in managing for ESH and young forest across the DBNF and managing for "demand species." We believe that the decision was a mistake. The documented effect of West Nile Virus on ruffed grouse population declines confounds associations between population and habitat. And the extremely small community of grouse hunters makes using trends in harvest data a dubious metric. Further, ruffed grouse are considered "Very Common" (G5) globally and having "Many Occurrences" (S4) in Kentucky.

[19] Greenberg, Cathryn H.; Weeks, Kendrick; Warburton, Gordon S. 2015. The historic role of humans and other keystone species in shaping central hardwood forests for disturbance-dependent wildlife. Pages 319-354 36 P. In: Greenberg, CH and BS Collins (eds.). Natural disturbances and historic range of variation: Type, frequency, severity, and post-disturbance structure in central hardwood forests USA. Managing Forest Ecosystems, 2015, Vol. 32. 400pp.

Regardless, the Forest Plan designated two Ruffed Grouse Emphasis areas (Forest Plan prescription area 3.H.1) and added a third through a Forest Plan amendment. Based on statements and projects from DBNF staff over the last few years, it seems that the Forest Service now considers most of the DBNF to be a "Ruffed Grouse Emphasis" area.

Even so, the Desired Ecosystem Condition for 3.H.1 Ruffed Grouse Emphasis calls for "an early-aged forest mosaic within the larger mature forest landscape… Management activities and occasional natural disturbances create[ing] canopy openings, generally around 20 acres in size." 3.H.1-Objective 1.B. calls for the Forest Service to "Develop dense hardwood-dominated seedling/sapling stands greater than 5 acres in size, preferable around 15 – 20 acres." These pockets of regeneration of substantially smaller than those proposed in the Jellico project. Even if we accept management for grouse as a proxy for successful ESH conditions, the size of harvest areas far exceed those recommended for grouse in the Forest Plan. Further, the distribution of planned regeneration harvests (and past clearcuts) will result in a situation where the "early-aged forest mosaic" will not exist "within (a) larger mature forest landscape."

The Forest Service needs to take a hard look at the types and distribution of ESH on private and federal lands. Assessing wildlife abundance and needs should incorporate direct surveys as well as feedback from the community. We've directly observed large flocks of turkeys, grouse in ice-storm damaged forest, and bear scat. Community members have spoken about the large amount of wildlife they encounter. Alternative and more sustainable systems of ESH management should be assessed and considered. We include some suggestions below in our section on reasonable alternatives.

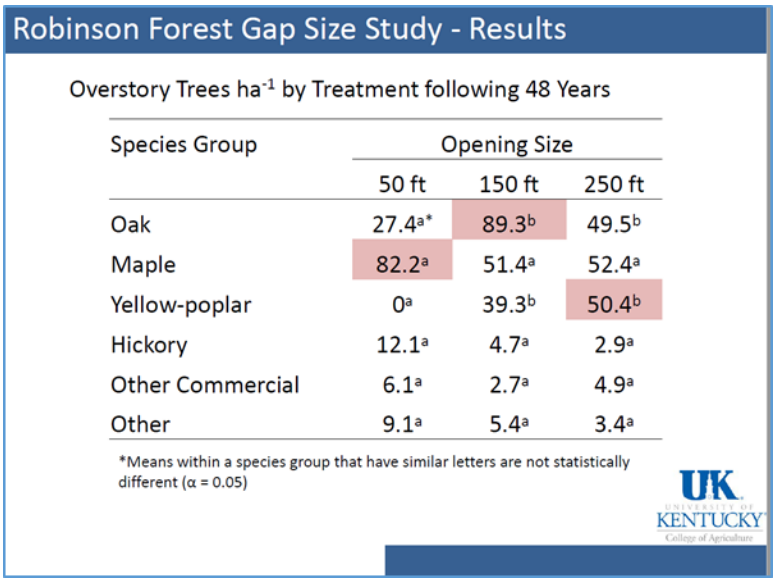
9. Oak regeneration

While oak regeneration is not mentioned specifically in the scoping letter, the Forest Service has in recent years and projects made much of the importance of oak regeneration – especially regeneration of white oak (*Quercus alba*). Our observations and data collection across the DBNF show that regeneration harvests conducted in the 1980s and 1990s resulted in a loss of oaks and hickories and corresponding increase in red maple and tulip poplar. As discussed in the section on Natural Range of Variation, many of the forest communities in the Jellico mountains naturally have minimal representation of oaks in the overstory. It is also the case that many historically oak-dominated stands have little advanced oak regeneration in the understory, meaning that regeneration cuts will fail to regenerate oaks.

An abundance of research and silvicultural practice demonstrates that oaks (and especially white oak) are mid-tolerant species, meaning that they are shade intolerant but also not competitive in high light environments. Removing the overstory through clearcut, shelterwood, or even deferment harvests, is unlikely to result in oak regeneration and will further a compositional shift in our forests to reduced oak abundance. Successful management for oaks generally requires midstory reductions, some reduction in overstory density, and the introduction of fire (which is

not included in the proposed action). While the Jellico project does include commercial thinning, it appears that most of that thinning is targeted at young forests and is aimed more at timber stand improvement than restoration of open oak forests. While even-aged systems have been the "go-to" tool for upland oak management, research from the University of Kentucky suggests that intermediate-sized group selection with adjacent thinning (i.e., femelschlag or expanding gap silviculture), along with midstory thinning, may be optimal for supporting oak recruitment.

We provide here information from a presentation by Dr. John Lhotka of the University of Kentucky[20]. He presents data from Robinson Forest showing that group selection harvests of about 0.4 acres (150 foot gap) result in substantially better oak development after 48 years than larger group harvests of about 1.1 acres (250 foot gap), with the latter resulting in a greater abundance of tulip poplar. This overabundance of tulip poplar is what has been observed in larger regeneration sites across the Redbird District (and Daniel Boone National Forest more broadly). Dr. Lhotka states, "Dominant and codominant oak density was maximized in 150 ft opening." He also states that "An expanding-gap irregular shelterwood that uses intermediate gap sizes and midstory removal as a preparatory treatment around gaps may represent a novel silvicultural practice for increasing oak regeneration potential within the CHFR (Central Hardwood Forest Region)."



Robinson Forest Gap Size Study - Results

Overstory Trees ha^{-1} by Treatment following 48 Years

Species Group	Opening Size		
	50 ft	150 ft	250 ft
Oak	27.4^{a*}	89.3^{b}	49.5^{b}
Maple	82.2^{a}	51.4^{a}	52.4^{a}
Yellow-poplar	0^{a}	39.3^{b}	50.4^{b}
Hickory	12.1^{a}	4.7^{a}	2.9^{a}
Other Commercial	6.1^{a}	2.7^{a}	4.9^{a}
Other	9.1^{a}	5.4^{a}	3.4^{a}

*Means within a species group that have similar letters are not statistically different ($\alpha = 0.05$)

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Figure showing oak recruitment declines with forest openings > 150 ft.

This same presentation by Dr. Lhotka presents research conducted in Berea College Forest by Drs. Lhotka and Stringer showing that optimal oak regeneration and development occurs in the edge environment just outside of harvest areas. They show less successful oak recruitment occurs *within* the harvest area than in the 20 m *outside* of the harvest area (in uncut forest). This

[20] Formulating an Expanding-Gap Regeneration System for Quercus Dominated Stands, John M. Lhotka, Department of Forestry, University of Kentucky

suggests that intermediate levels of harvest, or smaller harvests with greater spatial distribution (more edge effects), would better assist in recruiting oaks than 20 to 40 acre shelterwood harvests.

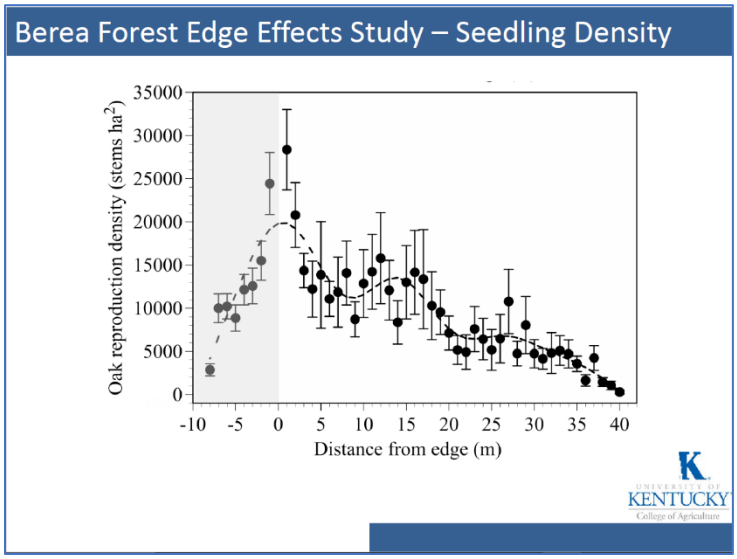

Figure showing oak reproducting decreasing with distance from from edge

While we are not suggesting that oak regeneration should be part of the purpose and need for this project, the Forest Service does need to take a hard look at the likely effects of the proposed action on oak regeneration. This means a critical assessment of past and current practices, understory conditions (i.e., advanced oak regeneration), and planned retention of oaks in the overstory – rather than a "faith-based" silvicultural approach that incorrectly reduces oak silviculture to "oaks need light, and clearcutting does that."

10. Slope instability and landslide concerns

Slope instability and landslides are an ongoing concern in the Jellicos. The combination of steep slopes, highly erodible soils, and the hydrologic properties of coal seams predispose the landscape to mass wasting events. Road construction (including skid roads) and timber harvest can substantially increase the likelihood of a mass wasting event to occur. Forest Plan Standards and Kentucky Best Management Practices (BMPs) are not designed to address issues of slope instability and are insufficient for the protection of soil and water resources in the Jellico Project area. Kentucky Heartwood has addressed these issues in great depth through our engagement with the DBNF over the South Red Bird project, including in our comments on the Draft EA, our predecisional objection, supplementation information letters, and legal complaint. While the Jellicos represent a distinct landform separate from Redbird, the issues are largely the same.

These concerns, and specific observations and examples, were provided to the Forest Service during the public meeting in Williamsburg on November 17, 2022. Several area residents spoke of seeing landslides and erosion after logging. A particularly revealing statement was made by a logger who said that he had logged private forest in the Jellico project area with care to follow state BMPs, and had the harvest inspected and closed out by the Kentucky Division of Forestry (KDF). Despite this, a landslide occurred a few years later. The logger candidly stated that it was a result of the logging he did, even though he followed the BMPs. These anecdotes localize rigorous scientific evidence which suggests logging and road building on steep slopes greatly increases landslide risk and size.[21, 22]

Kentucky Heartwood found a fresh landslide above the Jackson Creek tributary of Little Wolf Creek. The landslide began on Wolf Knob Road at about 1880' and ended at Jackson Creek at about 1460'. DBNF GIS data indicates that the stand was logged in 1990.

Major rainfall events are becoming a more frequent occurrence in eastern Kentucky, a trend expected to continue – and intensify – as climate change progresses. The impacts of these high precipitation events over the past several years, including in the Jellicos, are undeniable. From past analyses, it does not appear that the models utilized by the DBNF to assess and quantify sediment loading in streams account for these infrequent, high intensity events. It is imperative that the Forest Service consider the interaction of infrequent and extreme weather events on slope stability and soil and water resources. This includes both the impacts of landslides as well as the potential for increased flooding as clearcut and other regeneration cuts increase the volume and velocity of water entering stream channels.

We also suggest that the Forest Service consult with the Kentucky Geological Survey on the applicability of the newly developed landslide susceptibility models for eastern Kentucky to avoid logging and building skid roads on slopes with medium to high risk of landslides. [23]

11. Non-native invasive species

Non-native invasive plant species (NNIPS) are a significant concern in the Jellico mountains. It is well documented that logging can induce or exacerbate infestations of NNIPS. This is

[21] Wooten, R.M., Witt, A.C., Miniat, C.F., Hales, T.C., Aldred, J.L. (2016). Frequency and Magnitude of Selected Historical Landslide Events in the Southern Appalachian Highlands of North Carolina and Virginia: Relationships to Rainfall, Geological and Ecohydrological Controls, and Effects. In: Greenberg, C., Collins, B. (eds) Natural Disturbances and Historic Range of Variation. Managing Forest Ecosystems, vol 32. Springer, Cham. https://doi.org/10.1007/978-3-319-21527-3_9

[22] Heiken, D. Landslides and Clearcuts. https://oregonwild.org/sites/default/files/pdf-files/Heiken%2C%20D.%20Landslides%20and%20clearcuts%20-%20science.pdf

[23] Crawford, M. M., Dortch, J. M., Koch, H. J., Killen, A. A., Zhu, J., Zhu, Y., ... & Haneberg, W. C. (2021). Using landslide-inventory mapping for a combined bagged-trees and logistic-regression approach to determining landslide susceptibility in eastern Kentucky, USA. *Quarterly Journal of Engineering Geology and Hydrogeology*, *54*(4).

especially the case with regeneration cuts on steep slopes that require large amounts of soil disturbance to build skid road terraces. Tree of heaven (*Ailanthus altissima*) is a major problem. It appears that major infestations began following logging in the 1990s and little or nothing was done to mitigate the problem. The species is now widespread and in dominant canopy positions in many areas.

Field notes from USFS personnel provided to Tennessee Heartwood through the Freedom of Information Act describe major infestations (referred to here as AIAL) in several portions of the Ryans Creek area.

> "Continued on contour to west, hit location with extremely steep slope to road; not operable from this location downslope; started finding higher density of AIAL seedlings; continued west and found area of AIAL in canopy*, trees mostly in 6-8" range; trees occur downslope to near road per Mac who went that way to look at drains at road; Claudia and I continued west out of unit to find end of AIAL, headed downslope to old road bed-lots of canopy AIAL on this, some to 14"; followed to west for a distance—did not reach end of AIAL, but thinned out; returned east on old road; could use this with some uphill bank cutting to provide more stable base to the big steep drain—not possible to get over this with road/trail; really steep here; continued east on contour, AIAL seedlings still abundant, but no canopy trees…
>
> "*Area of AIAL canopy of great concern; this is obvious source of seeds feeding high density AIAL seedlings in the two units; wind would blow seed that direction; this canopy needs to come out (be killed) before any harvest activity in either unit; size of trees suggests it might take two years, maybe more of treatment; can be done IPT EA NEPA; if treatment does not occur, the two units will blow up with AIAL and will be lost for reasonable silvicultural activities; additionally, the units could become a seed source to seriously infest hundreds to thousands of acres of both NF and private land; the seedling density alone is a serious problem in the two units; allowing a seed source to remain in the area is an additional, exceptionally troublesome concern; it would also be good if trees could be pulled out as they will affect soil as they decompose; however, given steepness, it is probably better to leave than move them, unless can be pulled out to west on old road"

We have observed infestations of tree of heaven in several places in the Wolf Knob section of the forest. This includes multiple areas with large numbers in the canopy, and very likely producing seed. The areas we have seen are all adjacent to areas proposed for regeneration harvests. Controlling tree of heaven in the Jellico project area will be a cumbersome, but necessary, task. Had the Forest Service dealt with this after the last round of logging in the 1990s the situation wouldn't be nearly so bad. Regardless, the agency *must* control this species over large areas prior to allowing any logging activities to occur.

Tree of heaven, of course, is not the only NNIPS of concern. Local residents have complained specifically about their difficulties with autumn olive, and the presence of other NNIPs throughout the project area is a near certainty.

12. Threatened and Endangered bats

The Jellico project area provides habitat for Indiana bats (*Myotis sodalis*) and northern long-eared bats (*Myotis septentrionalis*), both of which are listed as endangered under the Endangered Species Act (ESA). U.S. Fish and Wildlife Service (USFWS) maps indicate the project area includes "Known Swarming 1 habitat" for Indiana bats and "Known Summer 1 habitat" for northern long-eared bats. Both areas are considered suitable habitat and should be considered occupied during the non-hibernating portions of the years. Consultation with USFWS should happen for both of these species. Further, the recent change in status for northern long-eared bats from "Threatened" to "Endangered" under the ESA should warrant a review and changes to the protective measures afforded the species under the current Forest Plan and 4d rule.

Both species of bats rely on large tracts of mature and interior forest for roosting, foraging, and raising young. Divoll et al. (2022)[24] state that:

> Both M. sodalis and M. septentrionalis are more likely to occur in closed canopy forest (Ford et al., 2005) and thus may respond negatively to large regeneration harvests (e.g., as predicted by Loeb, 2020); however, they may respond positively to fine-scale disturbances within larger forest patches (e.g., Loeb and O'Keefe, 2006).

While Indiana bats exhibit some tolerance for forest fragmentation and large openings in the forest, northern long-eared bats display little tolerance. Arant (2020)[25], researching bats and habitat use in southeastern Kentucky, found that northern long-eared bats avoided areas following harvest, stating "The lack of activity of these bats in harvests, however, suggests they do not actively forage within cuts" (Arant at 71; See also Figure 18 at 46; Table 3 at 48; Figure 19 at 58). Arant hypothesized that *Myotis* species avoided large openings in response to prey availability and exposure to predators. Divoll (2022) found that northern long-eared bats utilized lightly-thinned forest and small patch cuts (0.8 – 4.4 ha, or 2 – 10.8 ac) in a mature forest matrix, but generally avoided large clearcuts. The authors found that habitat use by northern long-eared bats exhibited the following preference: Water > historic thinning > patch cuts > recent thinning > historic openings > clearcut > developed > agriculture. The authors point out that preference for water sources was based on those sources being within a mature forest setting, stating

[24] Timothy J. Divoll, Stephen P. Aldrich, G. Scott Haulton, Joy M. O'Keefe (2022), Endangered Myotis bats forage in regeneration openings in a managed forest, Forest Ecology and Management, Volume 503
[25] Arant, Phil (2020). Effects of Shelterwood and Patch Cut harvests on a Post White-Nose Syndrome Bat Community in the Cumberland Plateau in Eastern Kentucky. University of Kentucky College of Agriculture, Food, and Environment.

"Supporting this, Huie (2002) showed that bat captures were higher than expected at small ponds within mature forest and lower than expected for small ponds within clearcuts in Kentucky."

An important aside is the use of the term "shelterwood." The DBNF has been using "shelterwood" to refer to regeneration harvests that leave a residual basal area of 10 to 20 ft^2/acre (retaining about 8% to 15% of volume). This deviates from the usage of the term in most forestry literature, as well as the bat studies cited here. For example, Arant (2020) described shelterwood harvests at Robinson Forest and lands managed by The Forestland Group as retaining about 50% of the timber volume. Divoll et al. (2022) state that "Traditionally, shelterwoods are considered regenerative; however, during our study, they were in early stages that more structurally resembled a thinning or selection harvest and, thus, we included them in recent thinnings," and describe the structure as "Canopy intact to partially open; low to moderate stem volume removal." Therefore, any statements that either Indiana or northern long-eared bats would benefit from "shelterwood" harvests as proposed in the Jellico project based on these or other studies would be misleading at best.

The aforementioned investigations and others demonstrate that northern long-eared bats have a high fidelity for summer roosting areas and utilize relatively small home ranges for foraging during summer (and lactating) periods. Silvis (2014) reported that overall colony roosting areas were between 1.3 and 58.8 hectares (3.2 and 145 acres). Divoll (2022) reported that northern long-eared bats foraged within 176 ± 25 hectares (435 ± 62 acres) and only traveled 1.6 km (1 mile) to forage.
The scale, intensity, and distribution of regeneration cuts proposed in the Jellico project could lead to significant impacts to northern long-eared and Indiana bats. The removal of large tracts of mature forests, including the complete sidelining of the interior forest provisions of 1.K-Objective 1.C., will likely degrade or remove Indiana and northern long-eared bat habitat beyond what was envisioned in the Forest Plan.

The fact is that the protective measure in the Forest Plan are largely meaningless without surveys – surveys which the Forest Service has repeatedly refused to conduct. The protections afforded to these species during the summer roosting season, including for maternity colonies during pups' non-volant period, are based entirely on protecting "known" colonies and roosts. But without surveys, these colonies and roosts cannot be known, and therefore cannot be protected. We insist that the Forest Service conduct surveys for Indiana bats and northern long-eared bats before approving any timber harvest in the Jellicos.

13. Threatened and Endangered aquatic species

The project area includes a substantial portion of the designated critical habitat for the federally-endangered Cumberland arrow darter (*Etheostoma sagitta*) as well as habitat for the federally-threatened blackside dace (*Chrosomus cumberlandensis*). As their names imply, they are found only in high quality streams of Cumberland plateau, making them biological jewels of Kentucky.

Kentucky's biological heritage is riding on the shoulders of the Forest Service's actions. Avoiding harm to these species should be central to any federal management, particularly when that management is proposed for the explicit purpose of supporting biodiversity. This is especially the case for species that the U.S. Fish and Wildlife Service (USFWS) lists as nearing extinction in part due to sedimentation and siltation from logging.

Specifically, USFWS states regarding the blackside dace:

> "Siltation also continues to be a major stressor of aquatic systems in the upper Cumberland River drainage.[26, 27, 28, 29] Excessive stream siltation is typically caused by soil erosion and stormwater runoff associated with upland land use activities (e.g., agriculture, forestry, mining, road or pipeline construction, and general urbanization)"[30]

Record-breaking rains, including the 16 inches that fell on July 30th, 2022, have resulted in major landslide events and erosion on steep slopes, and have impacted streams through increased sedimentation.[31] As discussed in our section on Slope instability and landslide concerns, the Forest Plan and Kentucky forestry BMPs are inadequate for preventing harm to the aquatic endangered species from extensive logging in the Jellico project area.

The Forest Service has a proactive duty to work toward the recovery of these species.

A delicate population of a federally-listed endangered mussel, the Cumberland Elktoe (*Alasmidonta atropurpurea*), has also been identified in Jellico Creek.[32] This is one of several populations which the USFWS describes as likely having low resiliency due to small and isolated population. One of the threats this mussel species faces are excessive sedimentation from resource extraction. Although only one individual of the species was found in 2005, and no surveys have been conducted in Jellico Creek since then, the US Fish and Wildlife Service states:

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[26] Kentucky Division of Water (2018) Integrated report to Congress on the condition of water resources in Kentucky, 2016. Assessment results with emphasis on the Big Sandy, Little Sandy, Tygarts River, and Kentucky River basin management units and a statewide update. Kentucky Energy and Environment Cabinet. Frankfort, Kentucky. 156 pp.
[27] Kentucky Division of Water (2018) List of Kentucky 303(d) streams, 2016 Integrated Report. Kentucky Energy and Environment Cabinet. Frankfort, Kentucky. 156 pp.
[28] Tennessee Department of Environment and Conservation (2014) 2014 305(b) report, the status of water quality in Tennessee. Division of Water Resources, Nashville, Tennessee. 114 pp.
[29] Tennessee Department of Environment and Conservation (2017) Final year 2016 303(d) list. Division of Water Resources, Nashville, Tennessee. 219 pp.
[30] U.S. Fish and Wildlife Service (2022) Blackside Dace, Phoxinus cumberlandensis (= Chrosomus cumberlandensis), 5-Year Review: Summary and Evaluation. Frankfort, Kentucky. 7 pp.
[31] Gray, B. Griffin, C (2022) Kentucky is getting wetter as climate change brings an era of extremes, data shows. Courier Journal.
[32] Watters, G.T. and S.H. O'Dee (2001) Patterns of vertical migration in freshwater mussels (Bivalvia: Unionoida). Journal of Freshwater Ecology 16:541-549.

> "The lack of observations and unknown status of some of the Cumberland elktoe populations listed above are in part due to low detection probabilities (a rare species with low densities) and could be compounded by mussel reproductive phenology. Depending on the timing at which surveys occur relative to their breeding phenology and the river conditions, mussels can be difficult to find. Negative surveys, therefore, do not necessarily indicate that a species is absent from a site, especially rare species.[33, 34]

At the very least we expect a robust, transparent analysis of potential impacts to the Cumberland arrow darter, blackside dace, and Cumberland elktoe, including consultation with the USFWS. It will be very challenging to not cause harm to these species given the scope and scale of this project and instability of slopes. The project either needs to be significantly revised or withdrawn altogether to prevent harm to these species.

Cumberland Darter (Photo courtesy of Dr. Matthew Thomas, KDFWR)

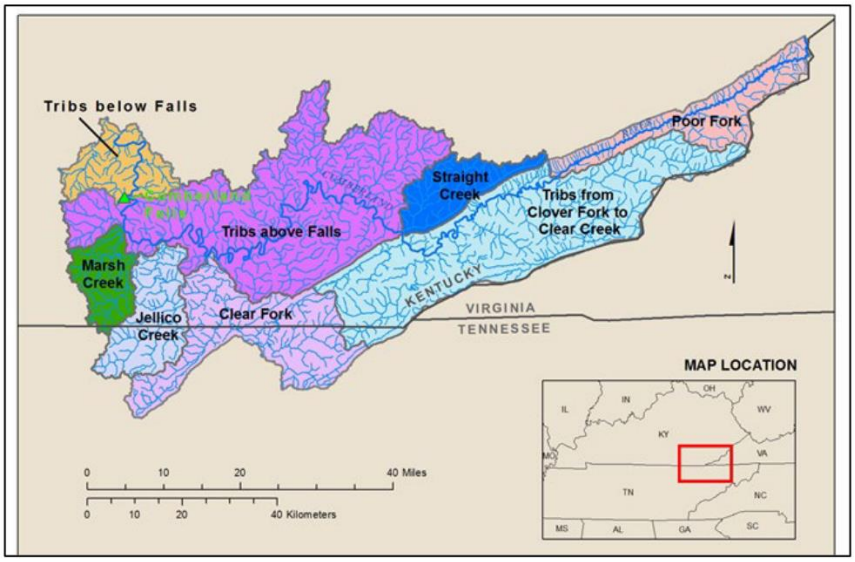
[33] Villella, R.F., D.R. Smith, and D.P. Lemarié (2004) Estimating survival and recruitment in a freshwater mussel population using mark- recapture techniques. American Midland Naturalist 151:114–133.
[34] U.S. Fish and Wildlife Service (2022) Cumberland elktoe, (Alasmidonta atropurpurea), 5-Year Review: Summary and Evaluation. Frankfort, Kentucky. 10 pp.

Two of only thirteen official designated critical habitat streams for the Cumberland darter (shown in red) are directly downstream of planned regeneration cuts[35]

Global range of the Cumberland darter
36

Photo credit: J.R. Shute, Conservation Fisheries, Inc.
Blackside dace

[35] https://ecos.fws.gov/ecp/species/1011
[36] https://ecos.fws.gov/ecp/species/1011



Global range of blackside dace[37]

14. Other species of concern

The Forest Service should consider the impacts of the proposed action on state-listed and other rare species not otherwise listed under the federal Endangered Species Act or included in the list Regional Forester's Sensitive Species (RFSS). It is unfortunate (and mystifying) how little overlap exists between the RFSS and species listed as endangered, threatened, or of special concern by the state of Kentucky.[38] Still, the Forest Service should work to conserve these species. It is worth noting that ruffed grouse is *not* listed by the state of Kentucky as endangered, threatened, or of special concern, though it is included in the state wildlife action plan.

We are aware the Forest Service has contracted with the Office of Kentucky Nature Preserves (OKNP) to conduct surveys of the Jellico project area. The Forest Service should ensure that those surveys are completed before an EA is completed, and that data complied during those surveys are considered in the EA. We learned OKNP surveys for the South Red Bird project (contracted by USFS) were completed after the EA was published the Decision Notice was signed. Data from the OKNP surveys that were available to the Forest Service prior to publication of the EA were not included or discussed in the EA. Kentucky Heartwood only learned of some of the significant conservation findings through the Freedom of Information Act, after the project had been approved. We hope that this is not the case with the Jellico project.

[37] U.S. Fish and Wildlife Service (1988) Recovery Plan for Blackside Dace (*Phoxinus cumberlandensis*). Southeast Region, Atlanta, Georgia. 27 pp

[38] Endangered, Threatened, and Special Concern Plants, Animals, and Natural Communities of Kentucky (2019), Office of Kentucky Nature Preserves, Kentucky Energy and Environment Cabinet

One species that we are particularly concerned about in the project area is the Allegheny woodrat (*Neotoma magister*). The Allegheny woodrat is not currently listed as endangered or threatened at the state or federal level, though is included in Kentucky's wildlife action plan. It's global status is "Uncommon" (G3) and state status is "Many Occurrences" (S4). However, little data have been collected on this species' status in Kentucky over the last two decades, and recent data from Ohio show a marked collapse of the species' population with extirpations in several counties. Racoon roundworm (*Baylisascaris procyonis*) appears to be a major factor in their decline, in addition to (or exacerbated by) disturbance around their cliffline habitats. The Forest Plan does include protections for clifflines. However, many of the sandstone outcrops that potentially provide woodrat habitat in the Jellicos may not meet the criteria for requiring buffers during timber harvest. We have documented woodrats in one such outcrop in the Wolf Knob area, and there are most certainly more. The Forest Service needs to ensure protection of these habitats, even where the size or extent of cliffline may not meet the threshold for protection under the Forest Plan.

We are also concerned about populations of Yellowwood (*Cladrastis kentuckea*). This uncommon tree species is ranked G4 and S3/S4 in Kentucky and found in the Jellicos primarily on north-facing slopes. The species is highly sensitive to disturbance, with a Coefficient of Conservatism (C-Value) of 9 indicating that the species has a "high fidelity to a narrow range of habitat requirements" and "Does not tolerate disturbance."[39] Logging, especially regeneration cuts, could result in serious impacts to this species. With its low tolerance for disturbance, its presence should serve as an indicator of forests that historically developed with minimal disturbance and where logging (especially regeneration harvests) should not occur.

15. Inappropriate use of even-aged management

Taking into account all of the above information, we find the use of even-aged management – including clearcut, two-age shelterwood (clearcut with reserves), and deferment harvests to be inappropriate in the Jellico mountains. The 1982 Forest Planning rule states:

> (3)When trees are cut to achieve timber production objectives, the cuttings shall be made in such a way as to assure that the technology and knowledge exists to adequately restock the lands within 5 years after final harvest. Research and experience shall be the basis for determining whether the harvest and regeneration practices planned can be expected to result in adequate restocking. ***Adequate restocking means that the cut area will contain the minimum number, size, distribution, and species composition of regeneration as specified in regional silvicultural guides for each forest type*** (emphasis added).

Previous clearcuts in the Jellicos (and elsewhere in the DBNF) have frequently resulted in a compositional shift away from the (stated) desired species composition (i.e., decrease in oak

[39] Tennessee-Kentucky Plant Atlas at https://tennessee-kentucky.plantatlas.usf.edu/plant.aspx?id=3569

abundance and increase in red maple and tulip poplar). In the Jellicos these regeneration cuts have further promoted tree of heaven has a major forest component. The Rule also states that "Silvicultural treatments shall not be applied where such treatments would make stands susceptible to pest-caused damage levels inconsistent with management objectives." Tree of heaven should fall under this category.

Further, the 1982 Rule states that:

> "Timber harvest cuts designed to regenerate an even-aged stand of timber shall be carried out in a manner consistent with the protection of soil, watershed, fish and wildlife, recreation, and aesthetic resources, and the regeneration of the timber resource."

Based on existing knowledge and community feedback, the proposed regeneration cuts pose a reasonably foreseeable risk to, at the very least, soil, watershed, fish, recreation, aesthetic resources, and the regeneration of the timber resource.

The 2012 Planning Rule expands on this. Section 219.11- *Timber requirements based on the NFMA* states:

> (a) *Lands not suited for timber production.*
> (1) The responsible official shall identify lands within the plan area as not suited for timber production if any one of the following factors applies:
> (iv) The technology is not currently available for conducting timber harvest without causing irreversible damage to soil, slope, or other watershed conditions;

And further:

> (d) *Limitations on timber harvest.*
> Whether timber harvest would be for the purposes of timber production or other purposes, plan components, including standards or guidelines, must ensure the following:
> (1) No timber harvest for the purposes of timber production may occur on lands not suited for timber production.
> (2) Timber harvest would occur only where soil, slope, or other watershed conditions would not be irreversibly damaged;
> (3) Timber harvest would be carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, and aesthetic resources.

Additionally, the Forest Plan states regarding the 1.K Habitat Diversity Emphasis management prescription that "Two-aged or Even-aged Young Forest**…**will primarily occur where forests are regenerated using two-aged or even-aged silviculture. The condition may occur in any forest type on any landscape position ***but will generally occur in upland oak, yellow pine or mixed oak and yellow pine forest types.***" (Forest Plan 3-33, emphasis added).

Much of the area proposed for regeneration cuts is in forests that are not upland oak, yellow pine, or mixed oak and yellow pine forest types. While the Forest Service *can* prescribe shelterwood cuts outside of the above-referenced community types, the agency must justify this specific deviation from the direction in the Forest Plan.

Given all of the above, we assert that even-aged timber harvest is an inappropriate management tool for much of the project area, and that a Forest Plan amendment that would designate steep-slope areas as "lands not suited for timber production" is warranted.

16. Forest carbon and logging

The Forest Service's analysis needs to consider the net greenhouse gas emissions from the proposed logging in an Environmental Assessment. While greenhouse gas emissions are cumulative, including the effects of many small contributors, logging 10,000 acres forest is sufficiently large for consideration of adverse effects under NEPA. The Forest Service did address concerns about logging and forest carbon in the response to comments for the Jellico IRMS. That response, however, reveals a misunderstanding of forest carbon and logging that fails to utilize the best and most current scientific information.

President Biden's Earth Day executive order states: "My Administration will manage forests on Federal lands, which include many mature and old-growth forests, to … retain and enhance carbon storage; conserve biodiversity; …[etc]."[40] By logging mature and old-growth forest in Jellico and causing massive amounts of greenhouse gas emissions the Forest Service will be acting contrary to the President's executive order.

In the Jellico IRMS Comment Consideration document, the Forest Service stated:

> "While old trees store more carbon than young trees, young trees grow more rapidly which allows them to remove much more carbon each year from the atmosphere than an older forest covering the same area. The efficiency of young forests at removing carbon from the atmosphere declines steadily with age, with a tree 120-150 years old storing more carbon than it is taking in from the atmosphere. Additionally, the wood products produced are able to store carbon long term. An older forest releases carbon directly back into the atmosphere as trees succumb to mortality. When wood is not harvested and allowed to decay in the forest, less wood products are created leading to less net long term carbon storage. For more information, see the following infographic at:

[40] Joseph Biden (2022) Executive Order on Strengthening the Nation's Forests, Communities, and Local Economies https://www.whitehouse.gov/briefing-room/presidential-actions/2022/04/22/executive-order-on-strengthening-the-nations-forests-communities-and-local-economies/

https://www.ncasi.org/wp-content/uploads/2021/01/NCASI22_Forest_Carbon_YoungVsOld_print.pdf "”[41]

The document further states:

> "Regarding U.S. forests, the Congressional Research Service notes a 30 percent increase of total carbon storage provided by aboveground biomass from 1990-2021 and a consistent negative net annual flux, meaning carbon sequestration annually outpaces carbon emissions. The increase in carbon storage is most prominent in not only U.S. forest aboveground biomass, but harvested wood products, both "in use" and "in disposal." Total amount of carbon stored has increased by around 6 million metric tons. Of that 6 million, approximately 74 percent is attributed to aboveground biomass and harvested wood products. This indicates that converting aboveground biomass to harvested wood products may actually increase total carbon stored long-term. For more information, see https://crsreports.congress.gov/product/pdf/R/R46313"

These responses are flawed in several respects and reflect outdated and incomplete models of forest carbon pools and changes in net ecosystem productivity (NEP) as forests age. It is also important to point out that the Congressional Research Service report cited above, contrary to the Forest Service's description, *does not* suggest that logging increases the overall carbon sequestering capacity of forests. The report (and the EPA source material) describes how some wood products can be considered long-term carbon pools depending on product and fate. But the report relies largely on FIA data and fails to account for carbon losses through milling, slash disposal, and other practices integral to timber harvesting as described below. Nor does the report make any claims about how logging and forest management affect a forest's carbon capacity to sequester carbon.

Further, the temporal scope of the analysis matters. Specifically, the *time* that it takes for a young forest to sequester the carbon emitted through logging matters. These issues are complex and variable, and some information must be gleaned from other forest regions. However, the available science demonstrates that the Forest Service's position is incorrect. We provide a review and discussion of these issues below.

16.1. Net ecosystem productivity and carbon sequestration in old-trees

Carbon sequestration in forests is often expressed as "net ecosystem productivity" or NEP. This is the net difference in a forest's uptake of CO_2 through primary production (photosynthesis) and

[41] Jellico IRMS Assessment Comment Consideration at https://usfs-public.app.box.com/s/k6wfnwld9ydytwzhvozkgcga5lc5gts9

losses through plant and soil respiration, including microbial decomposition. Previous models assumed that NEP approached zero as forests reached old-growth stages of development. However, these models have been upended.

Luyssaert et al. (2008) conducted a meta-analysis, examining data collected from temperate (70%) and boreal (30%) old-growth forests across the globe. They found that "biomass continues to increase for centuries," contrary to "the commonly accepted and long-standing view that old-growth forests are carbon neutral (that is, that photosynthesis is balanced by respiration)."[42]

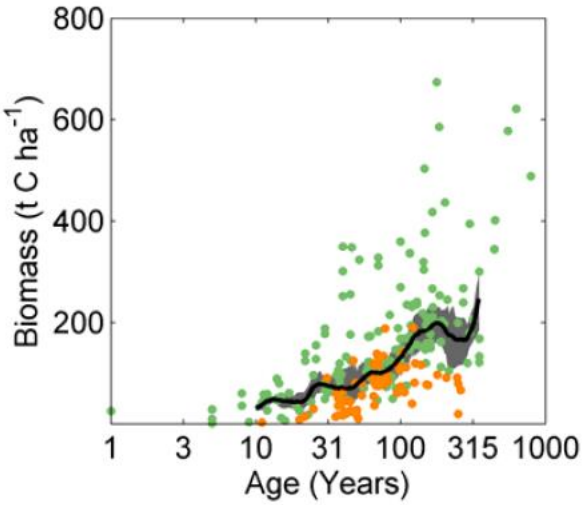


Figure from Luyssaert et al. (2008) showing biomass accumulations with forest age

McEwan et al. (2014)[43] assessed disturbance and fire intervals using tree ring data from Lilley Cornett Woods in Letcher County, Kentucky and found that the oldest trees continued to increase in growth rate after more than two centuries.

> "There was some indication that ring widths increased consistently over the life span of the trees sampled here (grey line, Fig. 1b). Individual series exhibited long-term growth patterns characterized by suppression and growth pulses. For example, the oldest tree in the FHC was a *Quercus montana* (top panel, Fig. 2) that exhibited ca. 100 yrs of suppression followed by a growth release that resulted in a step change increase in growth rate. The overall pattern, as evidenced by the individual series (Fig. 2) and the

[42] Luyssaert et al (2008). Old-growth forests as global carbon sinks. Nature Letters, Vol 455, 11 September 2008

[43] Ryan W. McEwan, Neil Pederson, Adrienne Cooper, Josh Taylor, Robert Watts, and Amy Hruska. Fire and gap dynamics over 300 years in an old-growth temperate forest. Applied Vegetation Science 17 (2014) pp. 312-322.

mean for all samples (Fig. 1b), suggests that maximum growth rates for these trees were being achieved near the end of the chronology, after the trees were ca. 200 years old."

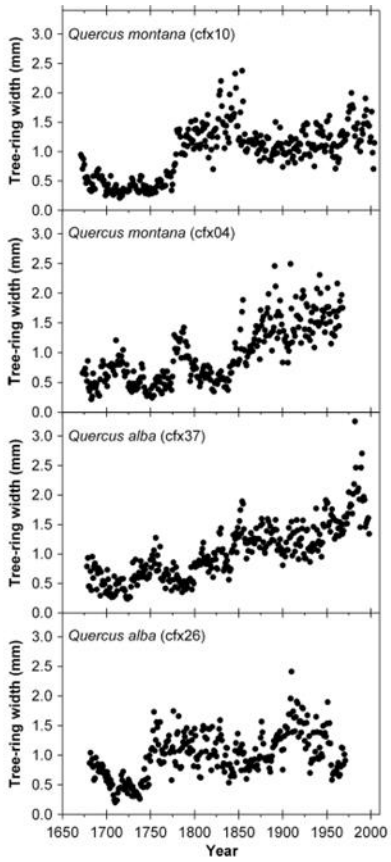


Fig. 2. Long-term growth patterns of the four oldest trees sampled as part of a fire history collection made in an old-growth temperate deciduous forest, central Appalachian Mountains, USA.

Figure from McEwan et al. 2014

In a newly published study, Au et al. (2022)[44] "examine(d) age-dependent drought sensitivity of over 20,000 individual trees across five continents and show(ed) that younger trees in the upper canopy layer have larger growth reductions during drought."

The article "Tree Growth Never Slows" in Nature (2014)[45] describes work by Stephenson et al. (2014), stating:

[44] Au, Tsun Fung & Maxwell, Justin & Robeson, Scott & Li, Jinbao & Siani, Sacha & Novick, Kimberly & Dannenberg, Matthew & Phillips, Richard & Teng, Li & Chen, Zhenju & Lenoir, Jonathan. (2022). Younger trees in the upper canopy are more sensitive but also more resilient to drought. Nature Climate Change. 10.1038/s41558-022-01528-w.

[45] Tollefson, J. Tree growth never slows. Nature (2014). https://doi.org/10.1038/nature.2014.14536

> "Many foresters have long assumed that trees gradually lose their vigour as they mature, but a new analysis suggests that the larger a tree gets, the more kilos of carbon it puts on each year.
>
> ""The trees that are adding the most mass are the biggest ones, and that holds pretty much everywhere on Earth that we looked," says Nathan Stephenson, an ecologist at the US Geological Survey in Three Rivers, California, and the first author of the study, which appears in the journal Nature. "Trees have the equivalent of an adolescent growth spurt, but it just keeps going."
>
> "Stephenson and his colleagues analysed reams of data on 673,046 trees from 403 species in monitored forest plots, in both tropical and temperate areas around the world. They found that the largest trees gained the most mass each year in 97% of the species, capitalizing on their additional leaves and adding ever more girth high in the sky."

In their paper, Stephenson et al. (2014)[46] state:

> "Here we present a global analysis of 403 tropical and temperate tree species, showing that for most species mass growth rate increases continuously with tree size. Thus, large, old trees do not act simply as senescent carbon reservoirs but actively fix large amounts of carbon compared to smaller trees; at the extreme, a single big tree can add the same amount of carbon to the forest within a year as is contained in an entire mid-sized tree. The apparent paradoxes of individual tree growth increasing with tree size despite declining leaf-level and stand-level productivity can be explained, respectively, by increases in a tree's total leaf area that outpace declines in productivity per unit of leaf area and, among other factors, age-related reductions in population density. Our results resolve conflicting assumptions about the nature of tree growth, inform efforts to understand and model forest carbon dynamics, and have additional implications for theories of resource allocation and plant senescence."

16.2. Carbon emissions from logging and the myth of "long-lived wood products"

While harvested wood products can represent a stable carbon pool until they are disposed of, life cycle analyses have revealed logging overall is not necessarily a tool for carbon sequestration as suggested by the Forest Service. Instead, the disposal of tree crowns and limbs (by burning or decay), the decay of root systems, and the accelerated decomposition (respiration) of saw dust and milling waste result in 64% of the carbon being released back into the atmosphere.[47] After

[46] Stephenson, N., Das, A., Condit, R. et al. Rate of tree carbon accumulation increases continuously with tree size. Nature 507, 90–93 (2014). https://doi.org/10.1038/nature12914

[47] Hudiburg, T.W. et al (2019) Meeting GHG Reduction Targets Requires Accounting for all Forest Sector Emissions. Environmental Research Letters 14 (9) https://iopscience.iop.org/article/10.1088/1748-9326/ab28bb

wood products are put into landfills and decay, another 16% of the carbon is released. Overall, 80% of the carbon that was once in the forest is released back into the atmosphere over a relatively short time, making logging a large contributor to greenhouse gases and not a sink. The state of Washington, for example, was found to be underestimating the state's total greenhouse gas emission by 25% by not including all emissions from logging.[48]

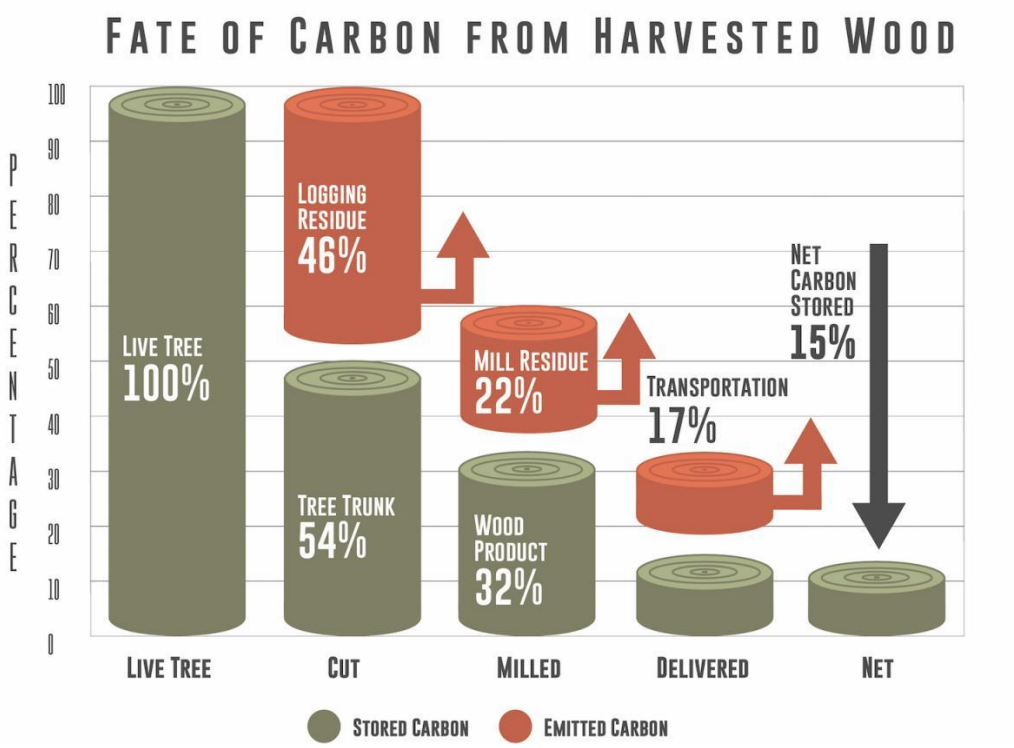


Figure from Oregon Wild [49] using data from USFS and peer reviewed studies[50,51]

(Continued on next page)

[48] Id
[49] C. Legue, J, Gonzales, A. Harris, D. Heiken (2018) Forest Defense is Climate Defense.
[50] Law, B.E. Hudiburg, T. Berner, L.T. and Harmon, M.E. (2018) Land use strategies to mitigate climate change in carbon dense temperate forests. Proceedings of National Academy of Science. 115 (14) https://www.pnas.org/doi/full/10.1073/pnas.1720064115
[51] Smith, James E.; Heath, Linda S.; Skog, Kenneth E.; Birdsey, Richard A. (2006) Methods for calculating forest ecosystem and harvested carbon with standard estimates for forest types of the United States. Gen. Tech. Rep. NE-343. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 216 p. https://www.nrs.fs.usda.gov/pubs/gtr/ne_gtr343.pdf

Several analyses of the forestry sector in Oregon found that roughly a third of the state's total greenhouse emissions can be attributed to logging (not deforestation).[52, 53] This makes logging the single greatest source for greenhouse emissions in Oregon – greater than the state's transportation sector and electricity use.[54] These emissions estimates include consideration of the fate of long-term wood products. Hudiberg et al. (2019)[55] state:

> "Methods are often in disagreement over the wood product Life Cycle Assessment (LCA) assumption of a priori carbon neutrality, where biogenic emissions from the combustion and decomposition of wood is ignored because the carbon released from wood is assumed to be replaced by subsequent tree growth in the following decades (EPA 2016). Despite a multitude of analyses that recognize that the assumption is fundamentally flawed (Harmon et al 1996, Gunn et al 2011, Haberl et al 2012, Schulze et al 2012, Buchholz et al 2016, Booth 2018), it continues to be used in mitigation analyses."

Cavender-Bares (2022) suggests that the monetized negative costs of greenhouse gases released by logging are typically greater than the economic value of the timber.[56]

The Forest Service's assessment thus far is not in line with the most recent and thorough scientific studies which suggest that logging – when considered comprehensively, and not just focusing on a narrow set of time periods or components – results in significant net carbon emissions. Simply put, the carbon released by logging, at best, will take many decades or even centuries to be sequestered again by new growth. As we rapidly approach a climatic tipping point these timeframes matter. Although regeneration harvests are not as harmful as deforestation, their climate impacts are not negligible. The Forest Service needs to follow NEPA's hard look requirements and use the most recent and best available science instead of outdated assumptions.

[52] Hudiburg, T.W. et al (2019) Meeting GHG Reduction Targets Requires Accounting for all Forest Sector Emissions. Environmental Research Letters 14 (9) https://iopscience.iop.org/article/10.1088/1748-9326/ab28bb

[53] J. Talberth (2017) Oregon Forest Carbon Policy: Scientific and technical brief to guide legislative intervention https://www.angelusblock.com/assets/docs/Oregon-Forest-Carbon-Policy-Technical-Brief-1.pdf

[54] https://www.oregon.gov/deq/ghgp/Pages/GHG-Inventory.aspx

[55] Hudiburg, T.W. et al (2019) Meeting GHG Reduction Targets Requires Accounting for all Forest Sector Emissions. Environmental Research Letters 14 (9) https://iopscience.iop.org/article/10.1088/1748-9326/ab28bb

[56] Cavender-Bares, J.M. Nelson, E. Meireles, J.E. Lasky, J.R. Miteva, D.A. et al. (2022) The hidden value of trees: Quantifying the ecosystem services of tree lineages and their major threats across the contiguous US. PLOS Sustainability and Transformation 1(4) https://doi.org/10.1371/journal.pstr.0000010

17. Recreation potential

The Jellicos are one of the most accessible sections of the DBNF from I-75 corridor in southern Kentucky. However, when you look at Stearns District website for recreational opportunities, no areas or opportunities are listed for the Jellicos, nor shown on the District recreational map.[57] This is despite the existence of lovely campsites along Jellico Creek, waterfalls on Rock Creek, the big trees, lovely flora, well-groomed gravel roads for mountain biking and driving, and outstanding vistas.

So why does the Forest Service fail to promote these incredible resources and assets? Outdoor tourism is more economically attractive and sustainable than logging. At a time when federal grants are being provided to private campgrounds and other outdoor recreation businesses in the area[58], it doesn't make sense that federal land wouldn't be aligned with recreational uses as well.

18. Range of reasonable alternatives

The Forest Service needs to consider and analyze alternatives to the proposed action that better meet the ecological and social needs of the Jellico forest while avoiding the severe and controversial impacts of the proposed logging. For example, we estimate that there are about 2,600 acres of forest that were clearcut in the 1980s and 1990s. Our observations are that many of these sites are in bad condition, dominated by tulip poplar, stump-sprouted maples, and even tree of heaven. Rather than minimal non-commercial thinning to release select trees (e.g., oaks and hickories) in these young stands, the Forest Service could cut or hinge-fell large numbers of overrepresented or undesirable trees to create ESH and young, high density forest while supporting oaks and other underrepresented species. This approach is backed up by the Kentucky Ruffed Grouse and Young Forest Strategic Plan 2017-2027. Objective 1, Strategy 2 for "grouse management prescriptions (for) large tracts of forestland in eastern Kentucky" includes "Use noncommercial practices to perpetuate high-stem-density cover" as one of the management approaches.[59] While there are direct costs to this type of management, DBNF leadership has in recent years made much of partnerships and donations from hunting organizations like the Ruffed Grouse Society, Rocky Mountain Elk Foundation, and National Wild Turkey Federation. It seems that these organizations could provide support to such ESH management to support those habitats while protecting resources and values that are important to other members of the public.

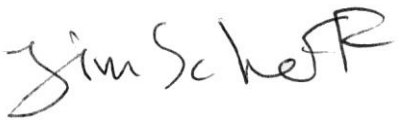
And while we do not support commercial logging in the Jellico project, we do believe that the Forest Service – if insistent upon logging – should consider alternatives that eliminate or strictly limit regeneration harvests, eliminate the construction of full-bench skid roads on steep slopes, and implement mandatory project-specific to avoid landslides.

[57] https://www.fs.usda.gov/recarea/dbnf/recarea/?recid=39716
[58] https://www.lanereport.com/160193/2022/10/24-4-million-in-funding-for-economic-development/
[59] Kentucky Ruffed Grouse and Young Forest Strategic Plan 2017-2027, page 6

Overall, the Forest Service *could* develop a proposed action based around the restoration of mid-density forests on south-facing slopes through thinning with more intensive management aimed at restoration of old clearcuts. This would provide ESH distributed across the landscape, support forest health and species composition, address the most significant social and environmental concerns, and allow for the development and conservation of old-growth and interior forests. It would just mean fewer trees sold.

We thank you for considering these comments and look forward to future dialogue.

Sincerely,



Jim Scheff, Staff Ecologist
Kentucky Heartwood
P.O. Box 1482
Berea, KY 40403